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DOES "EVOLUTION" EXPLAIN?

THE demand for a causal explanation of nature processes is inexpugnable from the mind. It is idle to tell us that one event or condition is habitually preceded or followed by another because they are thus juxtaposed in our experience—idle to suggest with Hume, Comte and their followers that all we need to know about change may be summed up by a classification of it into a series of regularly recurring successions. When the earth intervenes between sun and moon we want to know something more than that our satellite is darkened, something more than that when flame is applied to gunpowder the contact is regularly accompanied by a sudden evolution of gas, something more than that the presence of certain bacteria in the blood is the invariable concomitant of a particular disease. The habitual juxtapositions, the regularities of occurrence, the sequences of mode, must be observed and noted. But these do not suffice. The search for cause, however minimized or denied, is implicit in all scientific investigation: nature knowledge has been advanced and our power of predicting phenomena increased just to the extent that to knowledge of the uniformities of succession we have added a theory of the properties or powers which produce the succession and preserve the uniformities. Beneath the "how" of every vicissitude there is always a deeper "why." Things do not change spontaneously. We require a reason, a sufficing ground, an impulsion of some sort, capable

of satisfying us that the change must take place. If bodies are set in motion or brought to rest they are pushed or pulled: there is differential stress, with gravitative, electrical, chemical or muscular action at work as a determining force. We may not be able to "explain" the ultimate cause of change, but we must assume one, and our formal descriptions of the sufficing reason, expressed in terms of force, do really constitute explanation in the only sense in which we can use that term.

Now the doctrine of evolution is essentially a doctrine about changes. Opposing the old view of creation "all of a piece," whether out of nothing or out of something, and the equally untenable view of creation by sudden metamorphoses, it teaches that objects were not always as we see them to-day, but that they have assumed their present shapes and configurations by a process of gradual transformation, and that the vicissitude to which they are subject is still going on. Yet it is far more content to sum up the order of the changes than to offer an account of their producing determinations: it deals, in fact, with formal successions rather than with causal successions—tells us the how of vicissitude without feeling called upon to set forth its why. Fruitful as a formula, the doctrine has been successfully applied to the whole range of the phenomena accessible to us. But the very universality of the process—the ease with which the evidences of it can be accumulated, and the vivid effect which its concrete examples have on the mind—lead inevitably to an exaggerated interpretation of its nature and scope. Evolution is the mode in which material forms emerge or "unfold," yet it has been lifted to the rank of a primary power in the constitution of things. For the popular thought of the time we see it adopted as a key to the solution of all universe problems. Say only that something has been "evolved," and the statement is received as equivalent to an explanation. Even scientific men have

sometimes surrendered to the spell of this magic word, and if we would know how completely a merely model account of nature can be erected into a causal elucidation of nature it is only necessary to recall the recent words of an American astronomer: "Evolution is nothing more nor less than the mainspring of the universe. Grand in its very simplicity, it is the one fundamental fact to which all we know is ancillary. From its influence nothing can escape, for it has fashioned everything, from nebula to man." (*Bulletin of the Society of Arts*, 1909.)

Evolution begins in the inorganic with the appearance of matter—born out of some differentiation of the ether which sets free the play of gravitative forces. But science is undecided as to the nature of the process. Half a dozen hypotheses are in the field. The ether is continuous or it is granular; it is a sort of labile foam; its density is greater than that of steel; or perhaps there is no ether. The matter unit is a coagulation of ether; it is a knot in ether; it is ether in motion; it is corpuscular; it is electrical. A similar uncertainty prevails regarding many of the details of evolution. What, at the outset, is the relation of motion to the thing that moves? We still treat motion either as an ultimate, which does not need explanation through being uncaused, or as a produced derivative the cause of which remains obscure. If all ether energy is kinetic energy, and the thing which moves is refined away into electricity or some other form of motion, we are left with motions that move—a whole universe of them—as the source of the solidities we call matter, while matter is reduced to types of motion in motion. If ether energy is non-kinetic we still await an account of how motion arises and of the relation which must subsist, for the needed unitary view of them, between the energy which is not motion and that which is. If force can be exerted only against resistance, it would be interesting to know why physicists continue to

distinguish between motion against resistance, as on the earth's surface, and motion without resistance, as is alleged in the case of stellar and planetary motions. If there is anywhere in the universe a no-resistance to motion, what becomes of the thesis that action and reaction are equal, and how shall we distinguish between the conditions which initiate change and those which determine no-change? Is conservation of energy limited to the realm of motion, or does it include conservatism of mass?

The doctrine of evolution, with a formula that includes retrogression as well as progress, interests us most as a theory of advance, and it is here, if anywhere, that we have a right to be satisfactorily served. The whole realm of matter, inorganic and organic, has been ransacked to show that there is progress from states of disintegration to states of integration, from the homogeneous to the heterogeneous, from simplicity to complexity, from the undifferentiated to the differentiated, from the incoherent to the coherent. Yet the descriptions do not always fit the facts. If sometimes the contrasted processes and conditions exclude each other, at other times they are manifested in the same aggregate and the same area. Differentiation frequently appears as means to a larger kind of assimilation; the molecules of any particular type of matter, the units of any particular living tissue—all species, in fact, whether organic or inorganic—are fundamentally systems of likes. The changes which constitute social evolution may begin with differentiation, but the progress is finally from the heterogeneous to the homogeneous. In our modern human societies this aspect of advance dominates all others: everywhere we see peculiar institutional forms, social customs, ways of living, even fashions of dress, yielding to an assimilative process which, out of community character and national character, is making world character. As invention runs the industries of countries into like moulds, so commerce assimilates

peoples by promoting like needs and supplying like commodities. With the diffusion of dominant ideas in politics, science, art, literature, even religion, the planet is more and more becoming a community of the like-minded. And even language, which perfects itself by discarding the analytic distinctions and cumbrous inflections of its earlier period, thus progressing not from the simple to the complex, but from the complex to the simple, is already preparing to throw off those isolating distinctions which still make the peoples unintelligible to each other. Throughout international life we thus find writ large the process which is constantly going on within the species, the group, the community, the nation—the setting up of those closer relations which lead to assimilation, the likening which is required for coöperation, and the coöperation which in turn gives rise to the larger forms of resemblance and homogeneity.

It seems to be assumed that somehow or other changes are caused, for without determination of some sort matter would be indifferently at rest or in motion. But evolutionary doctrine leaves great gaps in the connections. Its cogs are often out of gear, and its piston has no visible connection with the driving wheel, plain as it is that the machine works. A tremendous breach of continuity is noticeable in its treatment of the change from inorganic to organic. How progress is made from an object which moves only as it is pushed or pulled to a self-moving system which renews itself after waste and reproduces its like remains after centuries of investigation as insoluble a problem for science as that of gravitation itself. Now the organism must arise out of the inorganic as an expansion of characters regnant also there, if in a more elementary form: it cannot have been thrust into the world as a new kind of object totally unrelated in its powers and functions to objects in general. Yet the appeals to chemistry and physics, to vitalism and neo-vitalism, to psychism and panpsychism, enforced by

researches however praiseworthy, have all failed to explain the transition. We cannot be put off with verbal formulæ which merely re-describe the problem they pretend to solve. It is not enough to tell us that organic matter is highly complex, possesses irritability, is capable of reacting to stimuli, assimilating nutriment, and the like. We want to know how these properties and powers emerge from the inorganic. We need to have cleared up for us—in all its connections, with all its pushes and pulls—the something which makes the living unit not merely dependent in the dynamic sense, but interdependent in the organic and structural sense; which sets up the demand by each for all, the insistence by all on each; which works only through the subordination of part to whole and the domination of part by whole; which, in a word, turns a congeries of molecules primordially indifferent to each other into a society of units system-sourced rather than self-sourced, to impel them one and all towards the self-maintaining activities and configurations that we call life. The analogies which thus relate the individual organism to the species of organisms and finally to human society as a whole must be capable of extension far beyond the limited realm of the living to the sources from which both animate and inanimate derive. But biology is too much concerned with the minute to seek the solvent for its problem in the large. The effect to explain vital characters spends itself mainly in exploration of the microscopic detail of cell structure. Study of the behaviour of the egg-cell after fertilization deals with a secondary process arising out of sex; and Mendelism, frequently mistaken for an explanation of heredity, is no more, if no less, than an account of one of its complications. Supremely untouched by any of these modern conquests of biology is the power of living protoplasm to reproduce its like. Solvents of secondary vital phenomena multiply, but life, out of which they proceed,

remains unanalysed and mysterious. In the attempt to elucidate the organism from itself science misses that large grasp of the nature of life which connects its creative function with the realm of the inorganic and finally with the cosmos.

As the evolutionary view fails to relate vital to pre-vital characters, so also does it fail to define the inorganic characters out of which heredity emerges as by necessity. The "dominants" of Reinke, the "determinants" of Weismann, the "engrams" of Semon, have all been called in to explain heredity, but their elucidations have been only verbal: they apply to cases in which heredity has become complex, or they subsume a physiological memory inseparably implicated with consciousness. Most scientific discussion in this field takes heredity for granted, as most scientific discussion regarding the "origin of species" takes life for granted. In both the interest centres in secondary results and in complications of these. Given germplasm, what is its relation to the soma or body of the organism? How do the fertilized germ-cells divide, the chromosomes arrange themselves and the processes of ontogenetic development begin? Why is asexual reproduction followed by sexual? Is amphimixis an accident, a mere form of nutrition, or a means of providing material for variation? Do body changes pass to the germ-cells, or do these vary on their own account? Are variations minute and gradual, or "kaleidoscopic?" What part does natural selection play in organic evolution: is it neo-Darwinism or neo-Lamarckism to which we must pin our faith? In all these matters science is at work, not in the foundations of vital phenomena, but on their superstructure. What we need supremely to know, as the very foundation of all other knowledge about the organism, is why and how matter, beginning as inorganic, develops vital characters, setting up that new order in the world of things which we call life.

Yet for science the secret of this portentous advance has thus far been withheld.

Vitalism, whether new or old, offers no help through this *impasse*, nor is the way out shown by the new school of science which teaches that inorganic matter may itself be alive, if with a lower order of vitality—that it may even have a dim sort of consciousness which needs only complexity to make it "intelligent." Psychism in matter tends to panpsychism, and psychism read into the universe process as a means of explaining it stultifies the only kind of "intelligence" we know anything about. It is our habit—imposed on us by our own natures as organisms—to view all appearances of contrivance organically. As our own intelligence is conscious, all other forms of intelligence must be conscious: wherever matter shows adaptation to ends, there we call in consciousness to function as the directing power. We do this in defiance of the plainest evidence, for growth is completed and intelligent processes go on within our bodies without the slightest direct let or hindrance from our conscious states, these being concerned, not with the building up of the organism or with its inner march of events, but with the general activities and mental processes which are needed for relating us to the environment. What we need to have unriddled for us is that power which enables the organism to act intelligently, without aid from consciousness, by virtue of its very nature as living matter—that order which connects the limited organic product with its source, the organism with the inorganic, the animate system with the pre-vital cosmos. The world spreads out before us as if shot through and through with mind. How are we to explain the bond of common process which everywhere links the purposive adaptations of nature with the consciously wrought contrivances of man? Why should the universe, like the intellect, segregate and classify, bringing likes together and

separating unlikes? What is it that matches the rounded boulder with the sphered planet; that relates the spiral of the nebula and the shell to the volute of the Ionic capital, and these to the curl of the wave as it breaks on the shore; that passes from regularly spaced ether pulses to regularly spaced air waves, sand waves and ocean rollers, to reappear in the iterated lines and patterns of man's decorative art; that makes one the geometry of the crystal and the geometry of the honeycomb, the intelligence that shapes the dandelion seed to the wind and the intelligence which builds up human industry, navigates the seas and explores the heavens? Of all this evolution tells us nothing.

In another way evolution is inadequate. Seen from the natural side its rationality is unimpeachable. It is the unfolding of power that eternally is into processes and configurations, into motions, structures, shapes. But the moment we try to make its intelligence conform to that of man our difficulties begin. For human intelligence—the only kind of intelligence we know—a plan is formulated complete, and the fashioning follows the plan. There may be discardings and rebuildings as knowledge accumulates and as new natural properties and methods of utilizing them come to be discovered. But the relation between the mind and its end at any instant is immediate, not provisional or advancing. Now while the machine is a system which works only after it is made, the organism is a machine that works while it is in the making. For the human architect or builder a palace comes out in one piece, not as a series of progressive modifications from an original cave dwelling or mud hut. What engineer planning a bridge would begin with a rope, substitute wood, then put in iron, and finally replace the whole with steel, if in knowledge and resources he were adequately equipped for his task from the beginning? The "Learn to labor and to wait" needs modification even as a bit of worldly wisdom: to address it to omni-

potence is neither logical nor reverent. Yet it is precisely this method of thought and afterthought, of completion and revision, of overturn and re-making, to which the evolutionary teleologists refer the whole furnishing of earth and sky. From non-nucleated protoplasm to nucleated, from unicellular to multicellular, from pre-gastrula to ectoderm and entoderm, from invertebrate to vertebrate, from quadruped to biped, with accompanying changes in modes of reproduction and endless blind alleys of structure and type, nature is one long march from the provisional to the incomplete, one long powerlessness to reach its goal by achieving in a stroke what is needed at once and *de toutes pièces*. And as man finds himself fastened to the evolutionary method, not by the choice of his intellect, but by the nature of his body and its relation to the cosmos, so man is compelled with only rare exceptions that prove the rule to work out his own welfare by the same alternations of rejection and advance, the same lingering in stages that satisfy until they are outgrown, the same beckoning of goals that promise finality only to recede or vanish when they are at last won. It was evolution that armed our predecessor with a flint when he needed a knife, that imposed a clepsydra on him when he deserved a clock, that put him off with sails when steam power should have been his, that kept the stylus in his hand when the printing press should have been recording and perpetuating his thoughts. Perhaps the acquirement of all these good things had to be gradual? How gradually do missionaries introduce clothes-wearing, modern implements and other innovations to the savages they teach? If centuries of evolution are needed for animals and peoples to become up-to-date, how are we to explain the sudden transformation in countries like China and Japan? But "the time was not ripe," "the world was not ready." Would the millions who died needlessly from disease have admitted their unreadiness for antiseptics and

antitoxines in the days before sanitary science and preventive medicine? Were industrial operations ripe for the helping hand of the state only with the advent of factory inspection and shorter hours, women ready to benefit from humane legislation only when the order came to unharness them from the coal truck and the embruting labor of the mines? What was it that so long remanded the reform of asylum and prison abuses if not the necessity of waiting on evolution? Was serfdom right even in Roman days merely because it had not yet been denounced? Is war justifiable because its abolition has not yet come within the range of "practical politics"? That which we see in all these human delays is the what is dominating the what ought to be, the deferred right turning present attainment into relative wrong, the deferred justice making actual conditions relatively unjust. And to the retrospect, individual or social, the sense of deprivation can never be wanting. Nobody will ever accept the view that he has lost nothing by having meted out to him to-day that which ought to have been his yesterday.

The evolutionary method in knowledge, as psychically interpreted, is open to similar objections. Nothing can well be advanced against gradual acquirement and constant revision as a process required by the order of nature. But the claim that it has been imposed upon man by an intellect of like kind with his, to whatever extent wiser and more resourceful, arouses a demurrer from which no system of apologetics will ever free us. "Truth in the making" by all means if, in struggle, suffering, tragedy, we must make it for ourselves; but if we are to be led to it through endless doublings and zigzags by a guide who, knowing the straight path, refuses to reveal it to us, the temper of revolt must be ours along every inch of the hard and stony way. Knowledge slowly and adventurously won, satisfaction following curiosity, the strain of quest rewarded with the joy

of conquest, a thousand times welcome! But offer it as a gift consciously bestowed on the instalment plan—grudgingly parcelled out in bits, like gulps of nourishment administered to the starving who should have been earlier fed—and the intellect rebels. What men need at all times is not the error tempered by fact, the wrong view to be condoned because it is workable, the interpretation *faute de mieux*, the theory sure to be outgrown, but “the truth, the whole truth, and nothing but the truth.” We do not instruct our youth that the sun goes round the earth, or that our planet is flat, with the remark that, when their minds are ripe for something better, such statements will be supplemented, revised or wholly superseded. What would be thought of a text-book in any branch of knowledge of which each chapter after the first should qualify, refashion or completely reverse the teaching of that which preceded it, or of which the closing chapter should form the introduction to a new series of affirmations and denials? The earth is the centre of the universe, and all bodies are subservient to it; the universe has no centre, and our planetary habitation is a moving mote in the star-spangled cosmos. The energies are distinct, gravitative, chemical, electrical, vital; the energies are varieties of one all-inclusive energy. The atom is the indivisible ultimate; the atom is divisible, and the electrons are the ultimates, or the ether unit is the ultimate. Mass is invariable; mass is variable according to speed. There is matter and there is electricity; there is no matter, and everything is electricity. Gravitation takes time to “travel;” gravitation is instantaneous. Heat is a substance; heat is a mode of motion. Light is an emanation from the eye; it is an emanation from objects; it is corpuscular; it is made up of pulses propagated in ether; it is distinct from electricity; it is an electromagnetic phenomenon. Life is divinely originated; it is due to a vital principle; it arises out of the physico-

chemical properties of matter. Life is created and species are immutable; life is evolved and species are mutable. The germ-cells are produced by the organisms in which they appear; they are left-overs from previous generations. Consciousness is the driving power of life; consciousness is an epiphenomenon or a psycho-physical parallel. Mind is the summated result of separate items of consciousness; mind is the unity which includes and dominates all these items. And so through the whole round of the sciences, from physics to psychology and from astronomy to sociology, we confront the same resting in half knowledge until it is outgrown, the same progress from old error to new error, the same advance from knowledge invalidated to knowledge provisional, the same lure towards finality and the same disappointments. The method of deferred truth is thus no more satisfying than the method of deferred justice. We accept them as the outcome of a nature of things with which consciousness, will, personality, can have had nothing whatever to do. Viewed as the result of plan, they stultify the only conscious intelligence which is known to us and the only mind of which we can rationally conceive. But give us the universe for our support, with a relative freedom to work out justice and achieve truth for ourselves, and the cruel antinomy dissolves before our eyes.

Any survey of this kind is obviously fatal to the psychic interpretation of nature. In the deepest aspect of such a view we find it weighted with the determination to see the universe not as all-productive and multi-potential, but as restricted to the development of mass and motion, of inter-determining forces, of bodies spatially limited and subject to causally produced change, of inorganic objects maintained and of organisms self-maintained, of life requiring knowledge for its safety and furtherance. And within this aspect, concerning us more nearly and on that account all the more misleading, is our tendency to assimilate the

cosmos yet further to ourselves by reading into it the characters of vitality, will, consciousness and mind—by linking it to human interests and conceiving of our relation to it in terms of human values and human aspirations. Now whatever this attitude may do for religion we cannot regard it as advancing science. The ambition of science, however disguised, is to explain, and the psychic interpretation does not explain: alike in return to the primitive ensoulment of nature and in resort to a supposed elementary vitality in the atoms, it merely adjourns a problem which the very hypothesis admits to be incapable of solution. We might as well try to account for the flower by assuming that stalk and roots are made up of units each of which has something of the flower character, or for water by assuming that it must be composed of atoms and molecules each of which has the water "property." We have here in physics, as once before in biology, the hypothesis of preformation where a theory of epigenesis is needed. Neither vitality nor consciousness can be traced to really ultimate units: they imply and require collectivity. And if we expand the doctrine into panpsychism we confront the insuperable difficulty of realizing how psychic characters ancillary to self-maintenance can either arise or function in an inorganic realm which shows neither activities nor structures that can rightly be called organic. Even if consciousness could be envisaged as a kind of universal entity—vaporous, ghost-like, or what-not—ready everywhere to invade matter, get a grip on it, and carry it along, as Bergson suggests, "to organization"—we should still be left with our puzzle all unriddled; the gap between organic and inorganic would continue to yawn, or would be bridged, not by causal relations, but by formal propositions; the appearances of plan in nature, the suggestions of design in plant and animal, the plain evidences of intelligent adaptations unconsciously reached throughout the realm of life, would receive a merely verbal,

not a real explanation. As by no assumption of an *élan de vie* do we approach even a pretence of accounting for life, so by no assumption of psychical "jets," "spurts," "leaps," "impulses," "upspringings," arising anywhen from anywhere, can we supply the links that are needed to relate the organism to the cosmos.

In seeking extra-organic aid from the *psyche*, whether scaled down to the "electrons" or scaled up to the universe, science is taking a road which—to the defeat of the very method on which its triumphs rest—can only end in a wild subjectivism. It has already accumulated knowledge enough for a provisional view of nature; all that it now needs is a rational use of the materials accumulated. And the goal to be reached clearly lies in the direction of realizing that the universe is infinitely more for itself than it can ever be for man. We must first give up our fatal habit of assuming that the cosmos can be lifted into respectability, as it were, only by projecting into it the local and peculiar characters which we find so valuable to ourselves. Subjectivism in the past has exalted us to a proud superiority over the inorganic things which it has been convenient to sum up as the ether, as matter, as mass and as motion. We have disparaged the world of power about us largely because, impressed by the visible and tangible, we early fell into the mistake of using them as a label for the universe in its totality. A cosmos with a vaster and richer content, alike of actuality and possibility now awaits our contemplation; and within its unutterable sweep we are to discern a system which becomes intelligible to us, not through our ability to spiritualize it, but through our power to interpret the phenomena it presents in the light, so far as may be, of its own nature, process and modes. The time has come to trace to power itself—to the accessible ground of the energies, forces, bodies, motions which we call cosmos—those appearances of design which, in the psychical interpretation

of them, have been subject to age-long acceptance as indications of "mind in nature." But to do this we must emancipate intelligence from necessary implication with consciousness, just as we must emancipate power from necessary implication with motion.

What do we mean, what ought we to mean, by "intelligence?" The subjective element of the conception is most emphasized when the biological sciences are not in question. Yet it is possible to think consciousness wholly away from vital activities without disturbing their modal character as end-reaching, while it is impossible to abstract mentally that character and conceive of them as "intelligent." Even when thrust most vividly upon our attention, consciousness appears only as an added instrumentality, not as a constitutive and fundamental principle. To realize how little we are entitled to look for it in the inorganic world we have only to remember that consciousness is not needed for the vital processes that go on within our own bodies and shades off to a vanishing point in plant life—only to recall that the living body has fashioned its organs unconsciously and without anything of the nature of plan aforethought. Why, then, in the lifeless, the inorganic, should we find "intelligent adaptations? The answer can only be that intelligence is not primarily and fundamentally conscious, but fundamentally and primarily dynamic; that the process we have so long tried to interpret psychically is rooted in the very modes of motion to which power gives rise; that we are in fact dealing with a universe which, strange as the paradox may seem, is "intelligent" before it can be conscious, and purposive before it can develop the faculties of mind. Accept this deliverance from the psychism which, after capturing metaphysics, now threatens science, and our most serious difficulties regarding organic evolution disappear. The self-maintenance we call life links up with the more elementary form of self-maintenance which we know as the

conservation of mass and the conservation of energy. Intelligent action by the organism in relation to environment, shown especially in the invention, fabrication and utilization of tools and machines, connects just as naturally with the unconscious artifice by which the living body develops organs within itself; so both relate themselves to their source in that vaster cosmic intelligence whose ordered configurations in the pre-vital realm appealed to the older teleologists as "evidences of design." For like reasons the account of organic progress as due to a "survival of the fittest" subordinates itself to an account of the origin of the fittest; chance in both organic and inorganic gives way to direction, the purposive is seen everywhere dominating the mechanical, and the real evolution comes into view.

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